

WHAT IS CLAIMED IS:

- 1 1. A method for managing workload distribution in a multiple processor cluster
2 system to conserve energy, comprising the steps of:
3 classifying persistent states and connections within said cluster system
4 according to an activity referencing said persistent states and connections;
5 receiving a request to modify a workload of said cluster system;
6 determining a minimum number of processors in said cluster system for
7 executing said modified workload while maintaining said persistent states and
8 connections;
9 determining a workload distribution within said minimum number of
10 processors that satisfies said modified workload while maintaining said persistent
11 states and connections; and
12 modifying an operation mode of a selected processor in said processors of said
13 cluster system to conserve energy while satisfying said modified workload while
14 maintaining said persistent states and connections.
- 1 2. The method of claim 1, further comprising the step of migrating persistent
2 states and connections within said cluster system to effect said workload distribution.
- 1 3. The method of claim 1, wherein said operation mode of said selected
2 processor is modified by setting said selected processor to an off mode.
- 1 4. The method of claim 1, wherein said operation mode of said selected
2 processor is modified by setting said selected processor to a stand-by mode.
- 1 5. The method of claim 1, wherein said operation mode of said selected
2 processor is modified by setting said selected processor to an active full power mode
3 from an off or a stand-by mode.

1 6. The method of claim 1, wherein said step of determining said workload
2 distribution for said minimum number of processors uses a constraint based bin
3 packing algorithm.

1 7. The method of claim 5, wherein a particular constraint of said bin packing
2 algorithm comprises minimizing a number of processes and states migrated to effect
3 said workload distribution.

1 8. A cluster system comprising;
2 a multiple processor central processing unit (CPU) having circuitry for
3 classifying persistent states and connections within said cluster system according to
4 an activity referencing said persistent states and connections, circuitry for receiving a
5 request to modify a workload of said cluster system, circuitry for determining a
6 minimum number of processors in said cluster system for executing said modified
7 workload while maintaining said persistent states and connections, circuitry for
8 determining a workload distribution within said minimum number of processors that
9 satisfies said modified workload while maintaining said persistent states and
10 connections, and circuitry for modifying an operation mode of a selected processor in
11 said processors of said cluster system to conserve energy while satisfying said
12 modified workload while maintaining said persistent states and connections;
13 a random access memory (RAM);
14 a communications adapter coupled to a communication network; and
15 a bus system coupling said CPUs to said communications adapter and said
16 RAM.

1 9. The cluster system of claim 9, further comprising the step of migrating
2 persistent states and connections within said cluster system to effect said workload
3 distribution.

1 10. The cluster system of claim 9, wherein said operation mode of said selected
2 processor is modified by setting said selected processor to an off mode.

1 11. The cluster system of claim 9, wherein said operation mode of said selected
2 processor is modified by setting said selected processor to a stand-by mode.

1 12. The cluster system of claim 9, wherein said operation mode of said selected
2 processor is modified by setting said selected processor to an active full power mode
3 from an off or a stand-by mode.

1 13. The cluster system of claim 9, wherein said step of determining said workload
2 distribution for said minimum number of processors uses a constraint based bin
3 packing algorithm.

1 14. The cluster system of claim 13, wherein a particular constraint of said bin
2 packing algorithm comprises minimizing a number of processes and states migrated
3 to effect said workload distribution.

1 15. A computer program product for managing workload distribution in a multiple
2 processor cluster system to conserve energy, said computer program product
3 embodied in a machine readable medium for energy management in a computer
4 system having a plurality of computation nodes, including programming for a
5 processor, said computer program comprising a program of instructions for
6 performing the program steps of:

7 classifying persistent states and connections within said cluster system
8 according to an activity referencing said persistent states and connections;

9 receiving a request to modify a workload of said cluster system;

10 determining a minimum number of processors in said cluster system for
11 executing said modified workload while maintaining said persistent states and
12 connections;

13 determining a workload distribution within said minimum number of
14 processors that satisfies said modified workload while maintaining said persistent
15 states and connections; and

16 modifying an operation mode of a selected processor in said processors of said
17 cluster system to conserve energy while satisfying said modified workload while
18 maintaining said persistent states and connections.

1 16. The computer program product of claim 15, further comprising the step of
2 migrating persistent states and connections within said cluster system to effect said
3 workload distribution.

1 17. The computer program product of claim 15, wherein said operation mode of
2 said selected processor is modified by setting said selected processor to an off mode.

1 18. The computer program product of claim 15, wherein said operation mode of
2 said selected processor is modified by setting said selected processor to a stand-by
3 mode.

1 19. The computer program product of claim 15, wherein said operation mode of
2 said selected processor is modified by setting said selected processor to an active full
3 power mode from an off or a stand-by mode.

1 20. The computer program product of claim 15, wherein said step of determining
2 said workload distribution for said minimum number of processors uses a constraint
3 based bin packing algorithm.

1 21. The computer program product of claim 20, wherein a particular constraint of
2 said bin packing algorithm comprises minimizing a number of processes and states
3 migrated to effect said workload distribution.